

# SPECIFICATION

Electronic Version 1.2.8

Stylesheet Version 1.0

## **Prosthetic Foot with Medial/Lateral Stabilization**

### **Background of Invention**

[0001] Field of the invention

[0002] This invention relates, generally, to the art of prosthetics. More particularly, it relates to improvements in prosthetic feet.

[0003] Description of the prior art

[0004] The prosthetic feet heretofore known are of rigid construction and are therefore of little utility on uneven terrain. Both the anterior and posterior sections of the foot are monolithic structures that cannot adapt to relatively small terrain features of the type that can cause a user to trip or fall.

[0005] There is a need, therefore, for a prosthetic foot that facilitates walking in uneven terrain.

[0006] However, in view of the prior art considered as a whole at the time the present invention was made, it was not obvious to those of ordinary skill in the pertinent art how the identified need could be fulfilled.

### **Summary of Invention**

[0007] The long-standing but heretofore unfulfilled need for an improved dynamic prosthetic foot is now met by a new, useful, and nonobvious dynamic prosthetic foot having medial/lateral stabilization. The novel prosthetic foot includes a sole having an anterior, toe section and a posterior, heel section. An ankle part separates from the sole along a transverse parting line and includes a gradual upward bend and a vertically extending part.

- [0008] At least one longitudinally extending slot is formed in the anterior section of the sole and divides the anterior section of the sole into at least two sections so that the at least two sections respond independently to uneven terrain. This enables a user of the prosthetic foot to ambulate across uneven terrain with less chance of falling as compared with a prosthetic foot lacking the at least one longitudinally extending slot.
- [0009] At least one longitudinally extending slot is formed in the posterior section of the sole to divide the posterior section into at least two sections so that the at least two sections respond independently to uneven terrain. This enables a user of the prosthetic foot to ambulate across uneven terrain with less chance of falling as compared with a prosthetic foot lacking the at least one longitudinally extending slot dividing the posterior section.
- [0010] A longitudinally extending slot divides the ankle part into a lateral pylon support and a medial pylon support. A lateral pylon connector is secured to a posterior side of the lateral pylon support and is adapted to securely engage a lateral pylon. A medial pylon connector is secured to a posterior side of the medial pylon support and is adapted to securely engage a medial pylon.
- [0011] The lateral pylon support has a greater thickness and thus less resiliency than the medial pylon support so that externally imparted forces appearing on the lateral pylon support are transferred at least in part to the medial pylon support whereby a sound leg may oppose the transferred forces.
- [0012] In a second embodiment, the lateral and medial pylon supports and pylon connectors are supplanted by elongate lateral and medial pylons that are about twenty inches (20") in length. A prosthetist cuts the pylons as needed when fitting the novel foot to a prosthetic socket.
- [0013] The elongate lateral and medial pylons are laminated at respective uppermost ends thereof to a prosthetic socket or are connected at respective uppermost ends thereof to a connector member that is laminated to the prosthetic socket.
- [0014] Alternatively, the lateral and medial pylons are connected at respective uppermost ends thereof to a pyramid-receiving connector that engages a pyramid that depends from the prosthetic socket.

- [0015] An important object of this invention is to provide a prosthetic foot having medial/lateral stabilization.
- [0016] A more specific object is to provide a prosthetic foot having an anterior section and a posterior section that are adapted to facilitate ambulation on an uneven terrain.
- [0017] These and other important objects, advantages, and features of the invention will become clear as this description proceeds.
- [0018] The invention accordingly comprises the features of construction, combination of elements, and arrangement of parts that will be exemplified in the description set forth hereinafter and the scope of the invention will be indicated in the claims.

### Brief Description of Drawings

- [0019] For a fuller understanding of the nature and objects of the invention, reference should be made to the following detailed description, taken in connection with the accompanying drawings, in which:
- [0020] Fig. 1 is a top plan view of a prosthetic foot with medial/lateral stabilization;
- [0021] Fig. 2 is a side elevational view thereof;
- [0022] Fig. 3 is a perspective view thereof;
- [0023] Fig. 4 is a top plan view of a second embodiment having elongate pylons;
- [0024] Fig. 5 is a side elevational view of the Fig. 4 second embodiment;
- [0025] Fig. 6 is a perspective view of the Fig. 4 embodiment;
- [0026] Fig. 7 is a perspective view of the elongate pylons embodiment when attached to a socket;
- [0027] Fig. 8 is a perspective view of the elongate pylons embodiment and further depicting connector means, in exploded form, for connecting said elongate pylons to a socket;
- [0028] Fig. 9A is an exploded first perspective view of said connector means;

- [0029] Fig. 9 is an exploded second perspective view of said connector means;
- [0030] Fig. 9C is a first perspective view of a pyramid-receiving connector; and
- [0031] Fig. 9D is a second perspective view of said pyramid-receiving connector.

## Detailed Description

- [0032] Referring to Figs. 1–3, it will there be seen that the reference numeral 10 denotes an illustrative embodiment of the novel dynamic prosthetic foot.
- [0033] Prosthetic foot 10 includes a sole 12, an ankle part 14 that separates from sole 12 at transverse parting line 16, and a heel 18 that is formed integrally and is generally coplanar with sole 12. Transverse parting line 16 is about mid-length of foot 10, being a little closer to the heel/posterior end thereof than the toe/anterior end thereof.
- [0034] Convexity 20 formed about mid-length of sole 12 performs a function corresponding to the ball of a natural foot. Concavity 22 is formed about mid-length of foot 10 and performs a function corresponding to the arch of a natural foot.
- [0035] Ankle part 14 includes a first upwardly-turned (with respect to sole 12) gradual bend 24 and vertically extending part generally denoted 26. A longitudinally extending slot 28 divides ankle part 14 into a lateral pylon support 30 and a medial pylon support 32. Slot 28 extends from a free end of ankle part 14 to a point slightly anterior to transverse parting line 16. → should be posterior?
- [0036] A lateral pylon, not shown, is secured by pylon connector 31 to a trailing side of lateral pylon support 30 and a medial pylon, not shown, is secured by pylon connector 33 to a trailing side of medial pylon support 32.
- [0037] Lateral pylon support 30 is a little thicker and thus less flexible than medial pylon support 32 as indicated in all three Figures, with the desirable result that externally imparted forces are transferred from the lateral side of prosthetic foot 10 to the medial side thereof as is the case in a natural foot. This directs such forces toward the natural leg of the prosthetic foot user, as is desirable.
- [0038] A first plurality of longitudinally extending slots, collectively denoted 34, are

formed in the anterior, toe section of sole 12. Each slot 34 extends from the toe end of the sole to a location that is on the anterior side of transverse parting line 16. Slots 34 are parallel to a longitudinal axis of sole 12 and are thus parallel to the direction of travel. Moreover, slots 34 are equidistantly spaced apart from one another.

[0039] Similarly, a second plurality of longitudinally extending slots, collectively denoted 36, are formed in the posterior section of heel 18. Slots 36 are parallel to a longitudinal axis of sole 12 and are thus also parallel to the direction of travel. Moreover, slots 36 are also equidistantly spaced apart from one another.

[0040] Each slot 36 extends from the heel end of the sole to a location that is substantially coincident with a vertical plane that cuts through sole 12 at the trailing/heel side of lateral pylon support 30 and medial pylon support 32.

[0041] The number and spacing of slots 34, 36, is not highly critical, but the number and spacing depicted is believed to be optimal.

[0042] Anterior slots 34 enable sole sections 38, 40, 42, and 44 to respond individually to bumps and depressions in terrain. Posterior slots 36 enable heel sections 46, 48, 50, and 52 to do the same. The user is therefore better able to ambulate on uneven terrain because the sole and heel sections of foot 10 do not respond monolithically to the terrain as in the prosthetic feet of the prior art.

[0043] A second embodiment, depicted in Figs. 4-6, has the same advantages as the first embodiment, but advantageously obviates pylon connectors 31 and 33. Pylon supports 30 and 32 are elongated to an extent of about twenty inches (20") and thus serve as lateral and medial pylons, 30a, 32a, respectively. A prosthetist cuts pylons 30a, 32a as needed when novel foot 10 is fitted to a residual limb.

[0044] Fig. 7 depicts the novel structure when equipped with elongate pylons 30a, 32a.

[0045] After pylons 30a, 32a have been cut to a desired length, the prosthetist has several options by which the pylons may be connected to prosthetic socket 54. Pylons 30a, 32a may be laminated into prosthetic socket 54 as illustrated in said Fig. 7. This forms a permanent connection between pylons 30a, 32a and socket 54.

[0046] A second option includes the use of a commercially available pyramid connector

60 as depicted in Fig. 8. Such pyramid connectors have been in use for fifty or so years. Pyramid connector 60 includes upper part 62 and lower part 64 that depends from the upper part. Upper part 62 is attached to the lowermost or distal end of socket 54. A hollow pyramid-receiving connector 66 has an open upper end 68 that receives lower part 64 of pyramid connector 60 and an open lower end 70 that receives the respective uppermost ends of pylons 30a, 32a. Lower end 64 of pyramid connector 60 and the respective upper ends of pylons 30a, 32a are captured in said hollow pyramid-receiving connector 66 by a plurality of set screws and other suitable fastening means, collectively denoted 72.

[0047] Pyramid connector 62 and pyramid-receiving connector 66 are employed to enable adjustment of the angle of pylons 30a, 32a so that prosthetic foot 10 falls in the correct medial/lateral and anterior/posterior planes, as perhaps best understood by making reference to Figs. 7 and 8.

[0048] A third option available to the prosthetist after cutting pylons 30a, 32a to their correct length is to laminate the pylons to an unillustrated component and to attach that component to the socket.

[0049] Figs. 9A and 9B provide a more detailed perspective view of pyramid connector 60 and pyramid-receiving connector 66. Figs. 9C and 9D provide a more detailed perspective view of pyramid-receiving connector 66.

[0050] It will thus be seen that the objects set forth above, and those made apparent from the foregoing description, are efficiently attained. Since certain changes may be made in the above construction without departing from the scope of the invention, it is intended that all matters contained in the foregoing description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

[0051] It is also to be understood that the following claims are intended to cover all of the generic and specific features of the invention herein described, and all statements of the scope of the invention that, as a matter of language, might be said to fall therebetween.

[0052] Now that the invention has been described,